Using Drones to Reduce Malaria Prevalence in Madagascar

Preparing a drone for spraying

A fleet of spraying drones resting between flights

OVERVIEW	
Flying Labs	Madagascar Flying Labs
Geographic area	Morombe, Madagascar
Date range	February 2022 to March 2023

Sector program	HealthRobotics
Main SDGs	GOAL 3: Good Health and Well-being GOAL 9: Industry, Innovation and Infrastructure

SCOPE	
Project stakeholders	Client: Abt Associates. Implementing partners: district and communities representatives from 39 villages.
People impacted	Communities of 39 villages.
Number of people impacted	Approximately 190,000 people.
Problem	In rural areas, anopheles mosquitoes responsible for malaria breed in wet zones such as the rice paddies around villages. Mosquitoes' behaviors are rapidly evolving. They are now active during the day, making the use of nets and in-habitat insecticide ineffective. In a world-first project, Abt Associates proposed to spray wet areas near villages with bio-insecticide as a way to destroy breeding sites and reduce malaria prevalence.
Project objectives	The project's goal was to successfully spray breeding sites to reduce mosquito activities in the affected communities. Our objectives included: ● Adequately mapping areas. ● Developing a methodology to define spraying areas. ● Undertaking spraying. ● Demonstrating the efficiency of the approach for Abt.
Scope	The project involved using Google Maps to get an overview of the target area, coming up with an approach to elect 39 project focus areas. The team then mapped all the 39 areas, analyzed the data, defined the spraying sites, and undertook spraying. The spraying exercise was conducted in 6 cycles, each with 2 passes.
Outcome	Research undertaken by Abt Associates revealed the following outcomes from the spraying activity: ● Over the monitoring period, a 95–97% reduction of the larval density was observed during the first two days post-treatment at each spray cycle. ● Larviciding provides very good larval control, but the residual activity seems to be short. ● The larval density assessment conducted 5 or 7 days after spraying indicated the presence of 1st and 2nd larval stage of Anopheles in the treated sites. ● The spray protocol and guidance for the treatment indicated an average of 14 days between each cycle. ● The renewal of the population after 7 days may need to be considered for future interventions.

Impact	For local communities, medium to long-term change would involve repeating the larviciding activity every year at a more intense rhythm than undertaken during this pilot project. Large scale larviciding could lead to eradication of malaria and improvement of community public health and wellbeing. This needs commitment from the international health organizations.
Challenges	The project areas are very remote and hard-to-reach, making logistics a challenge. We deployed drones with four-wheel-drive vehicles, which was costly.
Next steps	We hope that this activity will be mainstreamed in future health projects.

COMMUNITY ENGAGEMENT AND STAKEHOLDER SUPPORT	
Consent for cargo flight	We received authorization for flight for a specific site and consent from the community representatives.
Community engagement activities	Abt Associates engaged with local communities (owners of rice-paddies and local officials) in early behavior change communication activities. Our team received advice from the community leaders on the planned spraying dates. We conducted spraying activities in the presence of community representatives where possible.
Community groups engaged with	Community in general and community or village representatives.
Community attendance	Community representatives and farmers whose rice paddies were sprayed in the 39 communities included in the project.
Community feedback	At the start of the project, the communities were initially concerned about the spraying of agricultural plots and villages, which caused resistance. This was later solved through buy-in over time.
Stakeholder support	We developed the methodology for this project and provided the client with data and outputs. We also strengthened the client's capacity to develop the right approach to linking sanitary data (mosquito habits) with imagery (wet zones) and then turning it into a spraying plan.

CARGO	
Cargo transported	BTI (bio-insecticide)
Cold chain	N/A

HARDWARE AND SOFTWARE	
Cargo drone	DJI T30

Precision landing	N/A
Flight plan software	DJI software

FLIGHT OPERATIONS	
Delivery distance(s)	N/A
Number of flights	4916
Number of deliveries	N/A
Flight altitude	Within 50m above ground
Total cargo delivered	N/A
Total distance flown	N/A
Take-off/landing sites	39

COST BENEFIT ANALYSIS	
Speed savings	N/A
Cost savings	N/A